

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date
6 May 2004 (06.05.2004)

PCT

(10) International Publication Number
WO 2004/036979 A3

(51) International Patent Classification⁷: A01K 67/00, C12P 1/00, C12N 9/10, 1/20, 15/00, C07H 21/04
(74) Agents: CALDWELL, John, W. et al.; Woodcock Washburn LLP, One Liberty Place - 46th Floor, Philadelphia, PA 19103 (US).

(21) International Application Number:
PCT/US2003/034011

(22) International Filing Date: 23 October 2002 (23.10.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/412,649 23 October 2002 (23.10.2002) US

(71) Applicant (for all designated States except US): RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY [US/US]; Old Queens, Somerset Street, New Brunswick, NJ 08903 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): HAVKIN-FRENKEL, Daphna [US/US]; 772 Cranbury Crossroad, North Brunswick, NJ 08902-2204 (US). ZYLSTRA, Gerben, J. [US/US]; 32 Lake Drive, P.O. Box 632, Roosevelt, NJ 08555-0632 (US). FRENKEL, Chaim [US/US]; 772 Cranbury Crossroad, North Brunswick, NJ 08902-2204 (US). BELANGER, Faith [US/US]; 3 Agate Road, East Brunswick, NJ 08816 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
2 September 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 2004/036979 A3

(54) Title: PRODUCTION OF VANILLIN IN MICROBIAL CELLS

(57) Abstract: Transgenic microorganisms that produce vanillin when provided with caffeic acid or an esterified or other derivative thereof are disclosed. The organisms are transformed with expressible nucleic acid sequences encoding (1) a 3-O-methyltransferase, preferably from a plant source, which converts caffeic acid to ferulic acid and (2) either a eukaryotic (preferably plant) non-oxidative chain-shortening enzyme or a bacterial CoA ligase and enoyl-CoA hydratase/lyase enzymatic system, either of which converts ferulic acid to vanillin. Methods of making vanillin in the transgenic microorganisms are also disclosed.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/34011

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A01K 67/00; C12P 1/00; C12N 9/10, 1/20, 15/00; C07H 21/04
 US CL : 800/8; 435/4, 6, 41, 70.1, 183, 193, 252.3, 320.1; 536/23.2, 23.6

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 800/8; 435/4, 6, 41, 70.1, 183, 193, 252.3, 320.1; 536/23.2, 23.6

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	XUE Z-T et al. Kinetin-induced caffeic acid O-methyltransferase in cell suspension cultures of Vanilla planifolia and isolation of caffeic acid O-methyltransferase cDNAs. Plant Physiol. Biochem. Paris, 1998, Vol. 36, No. 11, pages 779-788.	34 and 37
Y	HAVKIN-FRENKEL et al. Vanillin Biosynthetic Pathways. Plant Cell and Tissue Culture for the production of food ingredients, [Proceedings of the Symposium on Plant Cell and Tissue Culture for the production of food ingredients], San Francisco, April 13-17, 1997, pages 35-43.	1-26, 28-30, 32-40
Y	US 2003/0070188 A1 (HAVKIN-FRENKEL et al.) 10 April 2003 (10.04.2003), see entire document.	1-26, 28-30, 32-40

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"B" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

09 June 2004 (09.06.2004)

Date of mailing of the international search report

02 JUL 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450

Facsimile No. (703) 872-9306

Authorized officer

Manjunath N. Rao, Ph.D.

Telephone No. (571) 272-1600

J. Robert for

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/34011

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claim Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim Nos.: 27 and 31 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claims 27 and 31 are not listed.

3. Claim Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

PCT/US03/34011

Continuation of B. FIELDS SEARCHED Item 3:
File BIOSIS, CAPLUS, EMBASE, MEDLINE, SCISEARCH, USPTO WEST, BIOTECHNO, BIOTECHABS, CANCERLIT, GENBANK.